Project Report

PA-229-7
(RSP)

Data Reduction Program Documentation
ALCOR Tape Read Package

(Effective: April 1971)

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R. H. French
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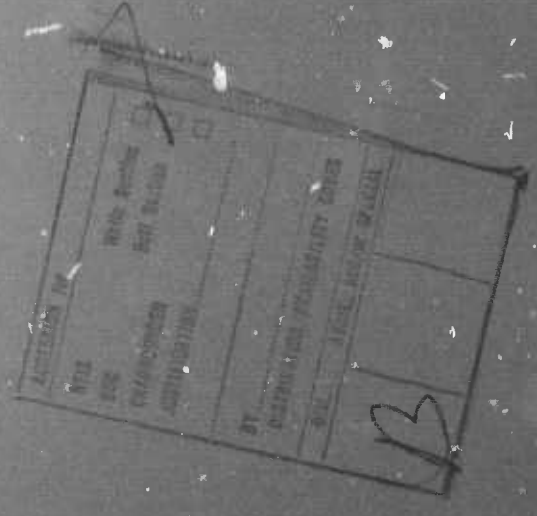
26 April 1971

Prepared for the Advanced Research Projects Agency, the Department of the Army, and the Department of the Air Force under Electronic Systems Division Contract F19628-70-C-0230 by

Lincoln Laboratory
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Lexington, Massachusetts



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Editors

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3760.

F19628-70-C-0230, ARPA Order-600

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Unclassified

207 650

The work reported in this document was performed at Lincoln Laboratory, a center for research operated by Massachusetts Institute of Technology. This work was sponsored by the Advanced Research Projects Agency of the Department of Defense (ARPA Order 600), the Department of the Army, and the Department of the Air Force under Air Force Contract F19628-70-C-0230.

FOREWORD

This is the seventh report in the Data Reduction Program Documentation series. It is dated according to the date of completion of the documentation. No implication is made that this program will not subsequently be modified, amended, or superseded, on the contrary, the history of radar data processing is one of continuous evolution of techniques, and it is unrealistic to assume that steady-state has been reached. The PA-229 series is being published for the convenience of interested parties, and Lincoln assumes no responsibility for the correctness of the information presented, nor for its currency.

The preparation of reports in this series is under the Editorship of Charles R. Berndtson of Lincoln, and of D.E. Nessman and R.H. French of Philco-Ford Corporation. Inquiries, suggestions, corrections, criticisms, and requests for additional copies should be directed to C.R. Berndtson.

The principal contributor to this report was G.L. Shapiro (Philco-Ford). Due to the intricate, evolutionary manner in which the programs came into being, the editors regret that it is in general impossible to give due credit to all -- mathematicians or radar analysts or programmers -- who contributed to the definition and writing of the programs.

Alan A. Grometstein

CONTENTS

COMMON SYMBOLS AND ABBREVIATIONS

(The units given for certain quantities are the units commonly used for those quantities, unless otherwise noted.)

ADT	ALCOR Data Tape
ALCOR	ARPA-Lincoln C-band Observables Radar
ALTAIR	ARPA Long-Range Tracking and Instrumentation Radar
Alt	Altitude (km)
APS	Average Pulse Shape
ARS	ALTAIR Recording System
Avg	Average, Averaging
Az	Azimuth (deg)
CADJ	Adjusted Calibration Constant (db)
C-band	ALCOR frequency, 5664 MHz (NB) and 5667 MHz (WB)
DBLT	Wide Band Pulse Doublet
El	Elevation (deg)
EOF	End of File
GMT	Greenwich Mean Time
h	Hours
Hz	Hertz
IF	Intermediate Frequency
in	Inches
LC	Left Circular Polarization
lsb	Least Significant Bit
min	Minutes
NB	Narrow Band
NRTPOD	Non-real Time Precision Orbit Determination Program
POD	Project PRESS Operation and Data Summary Report
Phase	Presented in deg
PRF	Pulse Repetition Frequency (pps)
PRI	Pulse Repetition Interval (s)
pps	Pulses per second
pts	Points

R	Range (km)
$\dot{R}$	Range Rate (km/s)
rad	Radians
RC	Right Circular Polarization
RCS	Radar Cross Section (dbsm)
RF	Radio Frequency
s	Seconds
SD_w	Standard Deviation of Wake Velocity
SDBLT	Wide Band Slaved Pulse Doublet
S/N	Signal-to-noise Ratio
T	Time
TAL	Time After Launch (s)
UHF	ALTAIR Frequency; 415 MHz
V	Velocity
V_d	Doppler Velocity
V_w	Mean Wake Velocity
VHF	ALTAIR Frequency; 155.5 MHz
WB	Wide Band
WBS	Wide Band Slaved
θ	Total Off-axis Angle (deg)
λ	Wavelength
*	Denotes Multiplication

FLOW DIAGRAM SYMBOLS

PROCESS, ANNOTATION

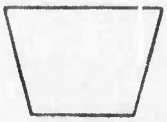
DECISION

TERMINATOR

SUBROUTINE: where NAME is the entry call into the subroutine

CONNECTOR: where P specifies a page in the flow diagram, and L designates a statement number in the program listing or a reference point in the flow diagram

CONNECTOR: where X implies a continuation of the diagram to the next page



INPUT/OUTPUT OPERATION

MAGNETIC TAPE

PUNCHED CARD

DISK

ALCOR TAPE READ PACKAGE

The ALCOR Tape Read Package retrieves data from the ALCOR Data Tape (ADT). It contains two IBM 360 assembler language subroutines which are called from the user's program. They are READJS and UNPACK.

A. READJS (See Appendix A.)

The first call to READJS opens the file and reads the ADT header record. The second call to READJS reads the ADT calibration record and stores the values in a buffer area. The main program extracts the individual calibration values it requires. Each subsequent call to READJS reads an ADT data record consisting of eight ALCOR pulses.

If a parity error or an end of file condition is encountered by READJS, indicators are set and transferred to the main program.

The call statement is READJS (INBUF, IEOF, IERR).

INPUT

INBUF First word in an ADT record#

OUTPUT

IEOF Indicator set if EOF is encountered
(0 = no EOF; 1 = EOF found)

IERR Indicator set if parity error is encountered
(0 = no parity error; 1 = parity error found)

B. UNPACK (See Appendix B.)

UNPACK unpacks the raw data from the ADT, and translates it into a format usable by the IBM 360/67 computer. The call statement is UNPACK.

INBUF (2) to INBUF (1803) contain the remaining words in the record.

Unpacked data for each pulse is transferred to the main program by a fixed common statement which is part of the main program. The common statement differs slightly depending on the program used.

The listing in Appendix B is used in ALCTAP and ALC10. Listings for the versions used by ALCPOD, ALC102, and ALERT are given in the reports describing those programs.

All items used in any common statement are defined below. Many items have been retained in the common statement even though they are no longer used because of changes in tape format.

STORED IN COMMON

INBUF	ADT data record consisting of 8 pulses (900 bytes/pulse)
IAZ	Az encoder angle (lsb = $360 * 2^{-17}$ deg)
IEL	El encoder angle (lsb = $360 * 2^{-17}$ deg)
INDEX	Not used
IPPRCS	Tracked target NB LC RCS (lsb = 1 dbsm)
IORS	Not used
IRANGE[#]	Uncorrected R (lsb = $14.989125 * 2^{-11}$ m)
IPKPWR	Peak transmit power[##] (counts)
IRDOT	Range rate (lsb = $14.989125 * 2^{-13}$ m/s)
IALT	Not used
INDAZ	Not used
JNDAZ	Not used
INDEL	Not used
IRB54	LC amplitude (counts) in Range Gate 52
IRB85	Not used
IOPRCS	Tracked target NB RC RCS (lsb = 1 dbsm)
1240B1	Reference channel log detector count
1240B2	ΔAz log detector count
1240B3	ΔEl log detector count
I241B1	Reference phase detector count
I241B2	ΔAz phase detector count
I241B3	ΔEl phase detector count

[#] See Appendix C.

[##] This is a misnomer. It is a value used in peak transmit power computation.[1]

XPPAGC[#]	Total LC attenuation (lsb = 1 db)
IBETA	Not used
NEWA	Attenuation flag: 0 = prior to 15 Oct 1970 1 = after 15 Oct 1970
IBAND	Not used
NSW[##]	Flag: 0 = compute transmission time of pulse 1 = do not compute transmission time
RBIAS[†]	8 range bias words [RBIAS (1) - RBIAS (8)] used for correcting R (μs)
ISVPRI	Not used
IHRS	Time pulse received, GMT h (lsb = 1 h)
IMIN	Time pulse received, GMT min (lsb = 1 min)
ISEC	Time pulse received, GMT s (lsb = 1 s)
IMSEC	Time pulse received, GMT ms (lsb = 1 ms)
ISTAT	Used by Subroutine STATUS called only by ALERT[2]
TRBIAS[†]	Range bias
ISTAT1	Not used
ISTAT2	Not used
ISTAT3	Not used
ISTAT4	Not used
IALSW, ISTSW	Used by Subroutine STATUS called only by ALERT[2]
NBWB	Not used
ISIGNO	Not used

[#] See Appendix D.

[##] Only in ALCPOD common statement.

[†] See Appendix E.

I27B12[#]	Pulse transmission: 0 = NB only; 1 = NB and WB
I115B2[##]	Not used
JCON	Counts pulses/record; when count reaches 9, a new record is read and count is reinitiated
NBEG	Initial pulse no. requested
NEND	Not used
ITST	Program Flag; indicates averaging interval completed
NUMPRI	PRI count
XOPAGC[†]	Total RC attenuation (lsb = 1 db)
ITBAND	Bandwidth: 0 = NB; 1 = WB
ITAPNO	Not used
IPRF[††]	PRF
IPOLAR	Polarization: 0 = LC; 1 = RC
ISSERR[†]	Attenuation slow switch flag: 0 = attenuation usable; 1 = attenuation indeterminate
PIFA	16 step LC IF attenuation (db)
OIFA	16 step RC IF attenuation (db)

[#] Not in ALERT common statement.

[##] Only in ALERT common statement.

[†] See Appendix D.

[††] See Appendix F.

PFSA	LC fast switch RF attenuation (db)
OFSA	RC fast switch RF attenuation (db)
PSSA	LC slow switch RF attenuation (db)
OSSA	RC slow switch RF attenuation (db)
PSSL	LC slow switch attenuator loss (db)
OSSL	RC slow switch attenuator loss (db)
ICODE	Code designating type of pulse: 0 = NB 1 = WB 2 = Phantom (not expected on ADT) 3 = WBS 4 = not used 5 = DBLT 6 = not used 7 = SDBLT
I273B5	Code for WBS waveform transmission: 0 = off; 1 = on
I273B6	Code identifying altitude region: 0 = endoatmospheric (< 120 km); 1 = exoatmospheric (> 120 km)
I273B7	Mode for control of offset range gates: 0 = automatic control[#]; 1 = manual control
I273B8	DBLT waveform transmission: 0 = off; 1 = on
IMOVP	Indicates whether primary and offset range gates are being moved manually; 62 to 66 counts: not moved; < 62 or > 66 counts: are moved; the separation between the primary and offset gates remains constant
IMOVO	Indicates whether offset range gates are being moved manually; 62 to 66 counts: not moved; < 62 or > 66 counts: are moved
IOFFST	Range offset (WBS and SDBLT) (lsb = $14.989125 * 2^{-11}$ m)

[#] Range offsets are a function of altitude region.

XDPTIM[#]	Pulse transmit time (GMT total s) (lsb = 10^{-6} s)
IDAT[##]	680 amplitude and phase data words for LC and RC (counts)

REFERENCES

1. "ALCOR Data Users Manual", (U), LM-86, Lincoln Laboratory, M.I.T. (17 June 1970), UNCLASSIFIED.
2. "Data Reduction Program Documentation, ALERT, (Effective: April 1971)", PA-229-11, Lincoln Laboratory, M.I.T. (to be published), UNCLASSIFIED.

[#] Only in ALCPOD common statement.

[##] Not used in ALERT common statement.

APPENDIX A

SUBROUTINE READJS PROGRAM LISTING

```
*                CALL READJS(INBUF,IEOF,IERR)
          START
          ENTRY READJS
          SPACE
XZBUF     EQU   4
XEOF      EQU   5
XERR      EQU   6
BASE      EQU   12
          SPACE
READJS    SAVE  (14,12),T,*
          BALR  12,0
          USING *,BASE
          ST    13,SAVEA+4
          LA    7,SAVEA
          ST    7,8(0,13)
          LR    13,7
          SPACE
          LM    XZBUF,XERR,0(1)
          SPACE
          L     7,IFRST1
          C     7,ZERO
          BNE   WHICHF
          SPACE
          OPEN  (INDCB,(INPUT))
          READ  RDB3,SF,INDCB,BUFF1,7212
          CHECK RDB3
          MVC   BUFNUM(4),ZERO
          MVC   IFRST1(4),ONE
          B     SK1
          SPACE
WHICHF    L     3,BUFNUM
          S     3,ONE
          BM    NEXTBUF2
          B     NEXTBUF1
          SPACE
NEXTBUF1  MVC   BUFNUM(4),ZERO
          CHECK RDB1
SK1       READ  RDB2,SF,INDCB,BUFF2,7212
          L     9,ABUFF1
          B     LOOPQ
          SPACE
NEXTBUF2  MVC   BUFNUM(4),ONE
          CHECK RDB2
```

```
         READ  RDB1,SF,INDCB,BUFF1,7212
         L     9,ABUFF2
         SPACE
LOOPC    LR    1C,XZPUF
         SR    11,11
         SR    3,3
         LA    8,1803
LOOPZ    L     7,0(3,9)
         ST    7,0(11,10)
         BCT   8,INDUP
         B     OUTLP
INDUP    LA    3,4(3)
         LA    11,4(11)
         B     LOOPZ
OUTLP    B     RETURN
         SPACE
BADRD    L     2,ONE
         ST    2,0(XERR)
         BR    14
         SPACE
ENDFILE  L     2,ONE          STORE END OF FILE INDICATOR
         ST    2,0(XEOF)
S99      CLOSE (INDCB,LEAVE)
RETURN   L     13,SAVEA+4
         RETURN (14,12),T
         SPACE
         CNOP  0,8
INDCB    DCB   DSORG=PS,MACRF=(RC),DEVD=TA,DEN=2,BLKSZ=1,EODAD=ENDFILE,C
               SYNAD=BADRD,BFTEK=S,DDNAME=FT11F001
         SPACE
         CNOP  0,4
ZERO     DC    F'0'
ONE      DC    F'1'
TWO      DC    F'2'
IFRST1   DC    F'0'
BUFNUM   DC    F'0'
         SPACE
ABUFF1   DC    A(BUFF1)
ABUFF2   DC    A(BUFF2)
SAVEA    DC    18A(*)
         SPACE
BUFF1    DS    1803F
BUFF2    DS    1803F
         END
```

APPENDIX B

SUBROUTINE UNPACK PROGRAM LISTING

```
          CSECT
          ENTRY UNPACK
UNPACK    SAVEL
          DROP  15
          CNOP  0,4
          BALR  2,0
          USING START,2,3
START     L     3,BASA
          L     4,DUBUF
          L     5,DUBUF
          L     6,DUBUF
          A     5,=F'4096'
          A     6,=F'8192'
          USING DBUF,4,5,6
          B     START1
DUBUF     DC    V(ICOM)
BASA      DC    A(START+4096)
START1    LA    8,INBUF   NUMPRI=8*INPR-1)+JCON
          MVC   TEMP(3),0(8)
          MVC   TEMP2(3),0(8)
          L     9,TEMP
          SLL   9,8
          SRL   9,16
          S     9,ONE
          SR    8,8
          M     8,EIGHT
          A     9,JCON
          ST    9,NUMPRI
          L     9,NPES
          C     9,NUMPRI
          BH    CDELTAR
          SPACE
          LA    8,WD273
          A     8,INDEX
          MVC   TEMP(3),0(8)
          L     9,TEMP
          N     9,=X'F0000000'
          SRL   9,28
          ST    9,ICODE                 COMPUTE THE CODE FOR PRI
          L     9,TEMP
          N     9,=X'08000000'
          SRL   9,27
          ST    9,I27385                WBS MODE INDICATOR
          L     9,TEMP
          N     9,=X'04000000'
          SRL   9,26
          ST    9,I27386                ENDO-EXO SCAN INDICATOR
          L     9,TEMP
          N     9,=X'02000000'
          SRL   9,25
          ST    9,I27387                WBS SCAN MODE INDICATOR
          L     9,TEMP
          N     9,=X'01000000'
          SRL   9,24
          ST    9,I27388                DOUBLET MODE INDICATOR
          L     9,TEMP
          N     9,=X'00100000'
          SRL   9,20
          ST    9,I27312                NB/WB INDICATOR
```

```
          SPACE
GOCDI     LA    8,WD233  COMPUTE GMT
          A     8,INDEX
          MVC   TEMP(3),0(8)
          L     9,TEMP
          N     9,=X'1FC00000'
          SRL   9,24
          ST    9,IHRS                    STORE HRS
          L     9,TEMP
          N     9,=X'003FC000'
          SRA   9,16
          ST    9,IMIN                    STORE MINS
          L     9,TEMP
          N     9,=X'00003FC0'
          SRA   9,8
          ST    9,ISEC                    STORE SECS
          LA    8,WD234
          A     8,INDEX
          MVC   TEMP(3),0(8)
          L     9,TEMP
          N     9,=X'7FE00000'
          SRL   9,21
          ST    9,IMSEC                   STORE MSEC
          SPACE
          L     10,ONE
          ST    10,IXC
          LA    10,IDAT
          LA    9,WD1
          SR    11,11
LOOPC     A     9,INDEX
          SR    12,12
          LA    8,170
          SPACE
LOOPD     IC    7,0(12,9) STORE ONE POLARIZATION (PP OR OP)
          SLL   7,24
          SRL   7,24
          ST    7,0(11,10)
          BCT   8,INDUP
          LA    11,4(11)
          SPACE
          L     9,IXC    GET NEXT POLARIZATION
          A     9,ONE
          ST    9,IXC
          C     9,TWO
          BE    PPPH
          C     9,THREE
          BE    OPLOG
          C     9,FOUR
          BE    OPPH
          B     OUT
          SPACE
INDUP     LA    12,1(12)
          LA    11,4(11)
          B     LOOPD
PPPH      LA    9,WD5P
          B     LOOPC
OPLOG     LA    9,WD118
          B     LOOPC
OPPH      LA    9,WD175
          B     LOOPC
```

```
          SPACE
CUT       LA    8,WD264                  PRF CALCULATION
          A     8,INDEX
          MVC   TEMP(3),0(8)
          L     9,TEMP
          ST    9,WORD64
          LA    8,WD273
          A     8,INDEX
          MVC   TEMP(3),0(8)
          L     9,TEMP
          ST    9,WORD73
          L     9,WORD64
          N     9,=X'FFFFE000'
          SRL   9,13
NZSTMP    ST    9,STEMP
          L     9,=F'10000000'
          SR    8,8
          D     8,STEMP
          ST    9,STEMP                  TRANSMITTED PRF
          SPACE
          L     9,INBUF
          SRL   9,31
          C     9,ZERO
          BNE   WBAND
          SPACE
          L     9,WORD73                 IN NARROW BAND
          N     9,=X'01000000'           BIT 8
          SRL   9,24
          C     9,ZERO
          BE    SLVDUB1
          SPACE
XDIV      L     8,FOUR                   IN DOUBLET MODE
XDIV1     ST    8,DIVSR
          B     NEWPRF
          SPACE
SLVDUB1   L     9,WORD73
          N     9,=X'08000000'           BIT 5
          SRL   9,27
          C     9,ZERO
          BE    NBNWBN
          B     XDIV                     IN SLAVED DOUBLET MODE
NBNWBN    L     9,WORD73
          N     9,=X'00100000'           BIT 12
          SRL   9,20
          C     9,ZERO
          BE    NDDIVS
          L     8,TWO
          B     XDIV1                    NB/WB E.C.P.
NDDIVS    L     8,ONE
          B     XDIV1                    NB ONLY
          SPACE
WBAND     L     9,WORD73
          N     9,=X'01000000'           BIT 8
          SRL   9,24
          C     9,ZERO
          BNE   SLVDUB2
          L     8,TWO                    IN DOUBLET MODE
          B     XDIV1
SLVDUB2   L     9,WORD73
          N     9,=X'08000000'           BIT 5
```

```
         SRL   9,27
         C     9,ZERO
         BNE   XDIV                    IN SLAVED DOUBLET MODE
         L     8,TWO
         B     XDIV1                   WB ONLY
         SPACE
NEWPRF   SR    8,8
         L     9,STEMP
         D     8,DIVSR
         ST    9,IPRF
NEXTW    LA    8,WD237
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'7FFFC000'
         SRL   9,14
         ST    9,IAZ                   STORE A2
         LA    8,WD236
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'7FFFC000'
         SRL   9,14
         ST    9,IEL                   STORE ELEV
GOOON    LA    8,WD265
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'FFFFE000'
         SRL   9,13
         ST    9,TEMP2
         LA    8,WD267
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'FFFF0000'
         SRL   9,16
         A     9,TEMP2
         SLL   9,11
         ST    9,TEMP2
         LA    8,WD266
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'FFE00000'
         SRL   9,21
         A     9,TEMP2
         ST    9,IRANGE                STORE RANGE
         LA    8,WD115
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'00FFC000'
         SRA   9,16
         ST    9,IPKPWR                STORE PEAK POWER
         LA    8,WD269
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         C     9,=F'0'
```

```
         BNL   DOTG1
         N     9,=X'7FFFFF00'
         SRA   9,8
         LCR   9,9
         B     DOTG2
DOTG1    SRA   9,8
DOTG2    ST    9,IRDOT                  STORE R-DOT
         SPACE
         LA    8,WD117
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'FF000000'
         SRL   9,24
         ST    9,IMOVP                  ARE PRIMARY AND OFFSET MOVING
         SPACE
         L     9,TEMP
         N     9,=X'00C0FF00'
         SRL   9,8
         ST    9,IMOVO                  IS OFFSET WINDOW MOVING
         SPACE
         SR    9,9
         ST    9,ICFFST
         L     9,ICODE
         C     9,THREE
         BE    OFFCOM
         C     9,SEVEN
         BE    OFFCOM
         B     OFFSKP
         SPACE
OFFCOM   LA    8,WD278
         A     8,INDEX
         MVC   TEMP(3),0(8)
         SR    9,9
         L     9,TEMP
         C     9,ZERO
         BNL   RPLUS
         N     9,=X'7FFFFF00'
         SRA   9,8
         LCR   9,9
         B     RNEG
RPLUS    SRA   9,8
RNEG     ST    9,ICFFST                 RANGE OFFSET FOR SLAVED WINDOW
         SPACE
OFFSKP   LA    8,WD263
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'F0C000C0'
         SRL   9,26
         LA    11,PIFA
         LE    0,0(9,11)                GET VALUE FROM PIFA TABLE
         STE   0,XPPAGC
         L     9,TEMP
         N     9,=X'0FC00000'
         SRL   9,22
         LA    11,CIFA
         LE    0,0(9,11)                GET VALUE FROM CIFA TABLE
         STE   0,XCPAGC
         L     9,ZERO
```

```
         ST    9,ISWSSP
         ST    9,ISWSSC
         ST    9,ISSERR
         LA    8,WD239
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'00000200'          CHECK BIT 23 (PFSA)
         C     9,ZERO
         BE    CKFSOP
         LE    0,PFSA
         AE    0,XPPAGC
         STE   0,XPPAGC                ADD IN PFSA VALUE
CKFSOP   L     9,TEMP
         N     9,=X'00000100'          CHECK BIT 24 (OFSA)
         C     9,ZERO
         BE    CKSSPP
         LE    0,OFSA
         AE    0,XOPAGC
         STE   0,XOPAGC                ADD IN OFSA VALUE
CKSSPP   L     11,TEMP
         N     11,=X'008C2000'
         C     11,=F'0'
         BNE   CKSSOP
INDET    L     8,ONE                   INDETERMINATE SITUATION
         ST    8,ISSERR
         B     CDELTAR
CKSSCP   L     11,TEMP
         N     11,=X'CC4C1000'
         C     11,=F'0'
         BE    INDET
PPTEST   LA    9,WD239
         A     9,INDEX
         MVC   TEMP(3),0(9)
         L     10,TEMP                 AUX.MICR.WORD INTO REG.10
         LA    9,WD252                 AUX.MICROWAVE WORD INTO REG.11
         A     9,INDEX
         MVC   TEMP(3),0(9)
         L     11,TEMP
         LA    9,WD272
         A     9,INDEX
         MVC   TEMP(3),0(9)            RANGE TR.WORD INTO TEMP
         N     10,=X'00802000'
         C     10,=X'00800000'
         BNE   S74
         LE    0,PSSL                  ADD IN PSSL (CONO.8)
         AE    0,XPPAGC
         STE   0,XPPAGC
         L     9,ONE
         ST    9,ISWSSP
S74      L     8,NEWA                  OLD OR NEW ATTEN.
         C     8,ZERO
         BE    OPTEST
         L     9,TEMP
         N     9,=X'00080000'
         C     9,=F'0'
         BE    RDBKLC                  ATTENUATOR READBACK
         N     11,=X'08000000'         S74 ARMED
         C     11,ZERO                 STATUS READ BACK
         BNE   SLC
```

```
NOATTLC  LE    0,PREVLC
         STE   0,XPPAGC
         MVC   JSWLC(4),ONE
         MVC   ISSERR(4),ONE
         B     OPTEST
RDBKLC   N     11,=X'04000000'        S74 NOT ARMED
         C     11,ZERO                 STATUS READBACK
         BE    NOATTLC
         B     OPTEST
SLC      LE    0,PSSA
         AE    0,XPPAGC                ADD IN PSSA (COND.B)
STORLC   STE   0,XPPAGC
         MVC   ISWSSP(4),ONE
OPTEST   LA    9,WD232
         A     9,INDEX
         MVC   TEMP(3),0(9)
         L     10,TEMP                 AUX.MICR.WORD INTO REG.10
         LA    9,WD252                 AUX.MICROWAVE WORD INTO REG.11
         A     9,INDEX
         MVC   TEMP(3),0(9)
         L     11,TEMP
         LA    9,WD272
         A     9,INDEX
         MVC   TEMP(3),0(9)            RANGE TR.WORD INTO TEMP
         N     10,=X'00401000'
         C     10,=X'00400000'
         BNE   S75
         LE    0,OSSL                  ADD IN OSSL (COND.B)
         AE    0,XOPAGC
         STE   0,XOPAGC
         L     9,ONE
         ST    9,ISWSSC
S75      L     8,NEWA                  OLC OR NEW ATTEN.
         C     8,ZERO
         BE    OUT1
         L     9,TEMP
         N     9,=X'00040000'
         C     9,=F'0'
         BE    RDBKRC                  ATTENUATOR READBACK
         N     11,=X'02000000'         S75 ARMED
         C     11,ZERO                 STATUS READ BACK
         BNE   SRC
NOATTRC  LE    0,PREVRC
         STE   0,XOPAGC
         MVC   JSWRC(4),ONE
         MVC   ISSERR(4),ONE
         B     OUT1
RDBKRC   N     11,=X'01000000'         S75 NOT ARMED
         C     11,ZERO                 STATUS READBACK
         BE    NOATTRC
         B     OUT1
SRC      LE    0,OSSA
         AE    0,XOPAGC                ADD IN OSSA (COND.B)
STORCC   STE   0,XOPAGC
         MVC   ISWSSP(4),ONE
OUT1     L     9,JSWLC
         C     9,ZERO
         BNE   OUT2
         LE    0,XPPAGC
         SE    0,=E'16'
```

```
         STE   0,XPPAGC
         STE   0,PREVLC
CUT2     L     9,JSWPC
         C     9,ZERO
         BNE   ENDALERT
         LE    0,XCPAGC
         SE    0,=E'16'
         STE   0,XCPAGC
         STE   0,PREVRC
ENDALERT MVC   JSWLC(4),ZERO
         MVC   JSWRC(4),ZERO
         L     9,ITBAND                  COMPUTE RANGE BIASES
         C     9,ZERO
         BE    NBAND
         LE    2,RBIAS+16                WIDE BAND TAPE
         STE   2,TRBIAS
         L     9,IPOLAR
         C     9,ZERO
         BE    LCPOLAR
         LE    2,RBIAS+20                OP POLARIZATION
         AE    2,TRBIAS                  ADD WB CP BIAS
         STE   2,TRBIAS
         L     9,ISWSSC                  ISWSSC WAS SET IN AGC COMP.
         C     9,ONE                     =1,ADD 32 DB (CP)
         BNE   CDELTAR
         LE    2,RBIAS+28                ADD IN OPSSA- RBIAS(8)
         AE    2,TRBIAS
         STE   2,TRBIAS
         B     CDELTAR
LCPOLAR  L     9,ISWSSP
         C     9,ONE
         BNE   CDELTAR
         LE    2,RBIAS+24
         AE    2,TRBIAS                  ADD IN PSSA-RBIAS(7)
         STE   2,TRBIAS
         B     CDELTAR
NBAND    LE    2,RBIAS                   NARROW BAND
         STE   2,TRBIAS
         LA    8,WC273                   CENTER OR EDGE TRACK
         A     8,INDEX
         MVC   TEMP(3),0(8)
         L     9,TEMP
         N     9,=X'00010000'
         C     9,ZERO
         BNE   CKNBEDGE                  EDGE TRACKING
         B     CKPOLAR                   CENTER TRACK
CKNBEDGE L     8,IRDOT                   CHECK SIGN OF R DOT
         C     8,ZERO
         BH    CKNBLOW
         LE    2,RBIAS+4                 LEADING EDGE BIAS
         AE    2,TRBIAS
         STE   2,TRBIAS
         B     CKPOLAR
CKNBLOW  LE    2,RBIAS+8                 TRAILING EDGE BIAS
         AE    2,TRBIAS
         STE   2,TRBIAS
CKPOLAR  L     9,IPOLAB                  CHECK POLARIZATION DESIRED
         C     9,ZERO
         BE    CDELTAR
         LE    2,RBIAS+12                ADD NB OP BIAS
```

```
         AE     2,TRBIAS
         STE    2,TRBIAS
CDELTAR  RETL
TEMP     DC     F'0'
TEMP2    DC     F'0'
IXC      DC     F'0'
NPTAPE   DC     F'0'
PRINUM   DC     F'0'
IPASS    DC     F'0'
ISWSSO   DC     F'0'
ISWSSP   DC     F'0'
DIVSR    DC     F'0'
WORD64   DC     F'0'
WORD73   DC     F'0'
STEMP    DC     F'0'
JSWLC    DC     F'0'
JSWRC    DC     F'0'
PREVLC   DC     E'0.0'
PREVRC   DC     E'0.0'
ZERO     DC     F'0'
ONE      DC     F'1'
TWO      DC     F'2'
THREE    DC     F'3'
FOUR     DC     F'4'
SEVEN    DC     F'7'
EIGHT    DC     F'8'
C10      DC     F'10'
C100     DC     F'100'
C1000    DC     F'1000'
CBUF     DSECT
INBUF    DS     CL3
WD1      DS     CL3        PP LOG D.
         DS     CL48
WD18     DS     CL3
WD19     DS     CL3
         DS     CL27
WD29     DS     CL3
WD30     DS     CL3
         DS     CL81
WD58     DS     CL171      PP PHASE D.
WD115    DS     CL3
WD116    DS     CL3
WD117    DS     CL3
WD118    DS     CL171      CP LOG D.
WD175    DS     CL171      CP PHASE D.
WD232    DS     CL3
WD233    DS     CL3
WD234    DS     CL3
         DS     CL3
WD236    DS     CL3
WD237    DS     CL3
         DS     CL3
WD239    DS     CL3
WD240    DS     CL3
WD241    DS     CL3
WD242    DS     CL3
         DS     CL27
WD252    DS     CL3
WD253    DS     CL3
         DS     CL27
```

```
WD263     DS    CL3
WD264     DS    CL3
WD265     DS    CL3
WD266     DS    CL3
WD267     DS    CL3
WD268     DS    CL3
WD269     DS    CL3
WD270     DS    CL3
WD271     DS    CL3
WD272     DS    CL3
WD273     DS    CL3
WD274     DS    CL3
WD275     DS    CL3
WD276     DS    CL3
WD277     DS    CL3
WD278     DS    CL3
WD279     DS    CL3
WD280     DS    CL3
          DS    CL6369
IAZ       DS    1F
IEL       DS    1F
INDEX     DS    1F
IPPRCS    DS    1F
IORS      DS    1F
IRANGE    DS    1F
IPKPWR    DS    1F
IROOT     DS    1F
IALT      DS    1F
INDAZ     DS    1F
JNDAZ     DS    1F
INDEL     DS    1F
IRB54     DS    1F
IRB85     DS    1F
IOPRCS    DS    1F
I240B1    DS    1F
I240B2    DS    1F
I240B3    DS    1F
I241B1    DS    1F
I241B2    DS    1F
I241B3    DS    1F
XPPAGC    DS    1F
IBETA     DS    1F
NEWA      DS    1F
BAND      DS    1F
NSW       DS    1F
RBIAS     DS    8F
ISVPRI    DS    1F
IHRS      DS    1F
IMIN      DS    1F
ISEC      DS    1F
IMSEC     DS    1F
STAT      DS    21F
TRBIAS    DS    1F
ISTAT1    DS    1F
ISTAT2    DS    1F
ISTAT3    DS    1F
ISTAT4    DS    1F
IALSW     DS    1F
ISTSW     DS    1F
NBWB      DS    1F
```

```
ISIGNO    DS    1F
I27B12    DS    1F
JCON      DS    1F
NBEG      DS    1F
NEND      DS    1F
ITST      DS    1F
NUMPRI    DS    1F
XOPAGC    DS    1F
ITBAND    DS    1F
ITAPNO    DS    1F
IPRF      DS    1F
IPOLAR    DS    F
ISSERR    DS    F
PIFA      DS    16F
CIFA      DS    16F
PFSA      DS    1F
CFSA      DS    1F
PSSA      DS    1F
CSSA      DS    1F
PSSL      DS    1F
CSSL      DS    1F
ICODE     DS    F
I27385    DS    F
I27386    DS    F
I27387    DS    F
I27388    DS    F
IMCVP     DS    F
IMCVC     DS    F
IOFFST    DS    F
IDAT      DS    682F
          END
```

APPENDIX C
IRANGE

The raw tracked target range (IRANGE) is recorded in a set of three registers: two coarse range registers (lsb = 15 m) and one fine range register (lsb = $14.989125 * 2^{-11}$ m). IRANGE is the sum of these three ranges, which is always larger than the true target range. The main program must correct for the difference between the true range and IRANGE. [#]

[#] See Appendix E and Ref. 1, Appendix E.

APPENDIX D

TOTAL ATTENUATION

The total LC (XPPAGC) and RC (XOPAGC) attenuation is computed in Subroutine UNPACK and transferred to the main program through the common statement. The equations used for attenuation depend on the date of the mission.

A. Missions between 15 February 1970 and 14 October 1970

$$XPPAGC\ (db) = PIFA(I) + PFSA(J) + PSSL(K) + PSSA(L) - 16$$

$$XOPAGC\ (db) = OIFA(I) + OFSA(J) + OSSL(K) + OSSA(L) - 16$$

where

PIFA and OIFA are sixteen step IF attenuators. The attenuation is found in Calibration Record Words 512 - 527 (PIFA) and 528 - 543 (OIFA) as a function of I.

I is found in ADT Data Record Byte No. 787 [Bits 1-4 (PIFA), Bits 5-8 (OIFA)].

PFSA and OFSA are fast switch attenuators. The magnitude of the attenuation is given in Calibration Record Words 592 (PFSA) and 594 (OFSA).

J is found in ADT Data Record Byte No. 717 [Bit 7 (PFSA) and Bit 8 (OFSA)].

PSSL and OSSL are slow switch losses. The magnitude of the loss is found in Calibration Record Words 629 (PSSL) and 630 (OSSL).

K has three possible values determined from the ADT data record as follows:

For PSSL

Byte 716 Bit 1	Byte 717 Bit 3	K
0	0	#
0	1	0
1	0	1
1	1	#

For OSSL

Byte 716 Bit 2	Byte 717 Bit 4	K
0	0	#
0	1	0
1	0	1
1	1	#

Indeterminate, therefore RCS data cannot be calibrated. When this occurs, a flag (ISSERR) is set for the main program, and XPPAGC and XOPAGC do not include slow switch losses or attenuation.

PSSA and OSSA are slow switch attenuators. The magnitude of the attenuation is given in Calibration Record Words 593 (PSSA) and 595 (OSSA).

L is found in ADT Data Record Byte 815 [Bit 5 (PSSA) and Bit 6 (OSSA)].

Note: If K is zero, PSSA and OSSA are not used and L need not be checked.

B. Missions after 15 October 1970

XPPAGC (db) = PIFA(I) + PFSA(J) + PSSA(L) - 16

XOPAGC (db) = OIFA(I) + OFSA(J) + OSSA(L) - 16

L is determined by combining the command to the slow switch attenuators, found in ADT Data Record Byte 815 [Bit 5 (PSSA) and Bit 6 (OSSA)], and the status readback of the attenuators, found in Byte 754 [Bits 5 and 6 (PSSA) and Bits 7 and 8 (OSSA)].

L has three possible values determined from the ADT data record as follows:

For PSSA

Byte 815 Bit 5	Byte 754 Bit 5	Byte 754 Bit 6	L
0	N/A	0	#
0	N/A	1	0
1	0	N/A	#
1	1	N/A	1

Indeterminate. When this condition exists, L is set equal to its previous value (previous pulse), XPPAGC and XOPAGC computed, and a flag (ISSERR) set for the Fortran main program.

For OSSA

Byte 815 Bit 6	Byte 754 Bit 7	Byte 754 Bit 8	L
0	N/A	0	#
0	N/A	1	0
1	0	N/A	#
1	1	N/A	1

Indeterminate. When this condition exists, L is set equal to its previous value (previous pulse), XPPAGC and XOPAGC computed, and a flag (ISSERR) set for the Fortran main program.

APPENDIX E
RANGE BIAS (TRBIAS)

TRBIAS is computed from 8 range bias words [RBIAS (1) - RBIAS (8)] as follows:

NB Data

Polarization	Track	TRBIAS
LC	Centroid	RBIAS (1)
LC or RC	Leading edge	RBIAS (1) + RBIAS (2)
LC or RC	Trailing edge	RBIAS (1) + RBIAS (3)
RC	Centroid	RBIAS (1) + RBIAS (4)

WB Data

Polarization	Slow Switch Attenuator	TRBIAS
LC	Inactive	RBIAS (5)
RC	Inactive	RBIAS (5) + RBIAS (6)
LC	Active	RBIAS (5) + RBIAS (7)
RC	Active	RBIAS (5) + RBIAS (8)

APPENDIX F

PRF DETERMINATION

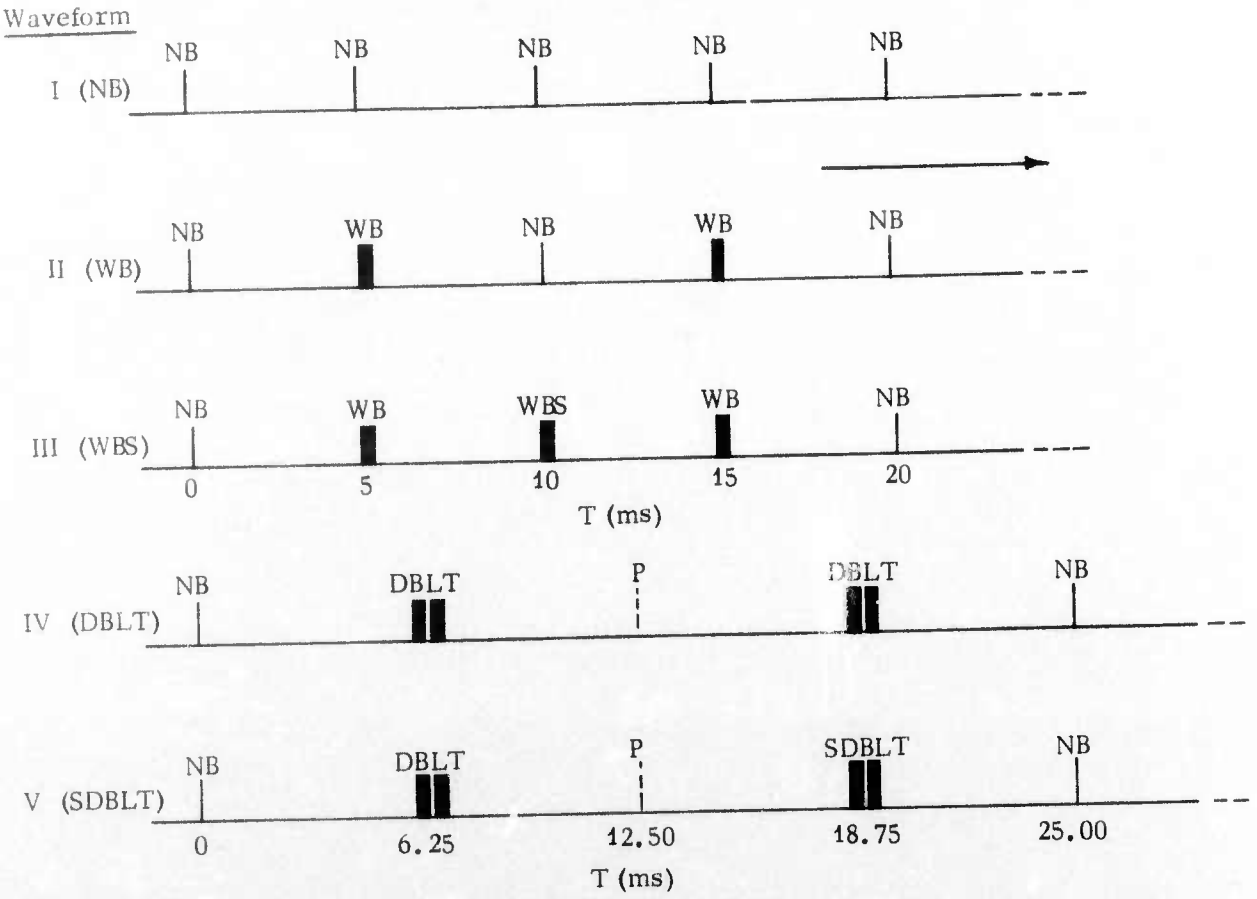
IPRF is the PRF for the particular waveform on the tape and is computed as follows:

Type of Data	Waveform[#]	IPRF
NB	DBLT	PRF/4
NB	SDBLT	PRF/4
NB	WBS	PRF/4
NB	WB	PRF/2
NB	NB	PRF[##]
WB	WB	PRF/2
WB	DBLT	PRF/2
WB	WBS	PRF/2
WB	SDBLT	PRF/4

[#] ALCOR waveforms are shown in Fig. 1.

[##] When in this mode the ADT may contain every pulse or, more frequently, every other pulse.

FIGURE 1
ALCOR WAVEFORMS



NOTES

1. All waveforms are shown at maximum system PRF.
2. Wide band pulse doublet leading edge to leading edge spacing is 23.2 μs.
3. The phantom pulse (P) is an imaginary pulse inserted by the Real Time Program for timing considerations. This pulse is not found on the ADT.